SECTION 713
METAL PIPE

713.1-BLANK

713.2-METALLIC COATED CORRUGATED STEEL PIPE AND PIPE ARCH:

Metallic coated corrugated steel pipe and pipe arch shall conform to the requirements of AASHTO M 36 for Type I and Type II pipe.

Special sections, such as elbows, for these conduits shall be of the same gage as the conduit to which they are jointed, and shall conform to the applicable requirements of AASHTO M 36.

713.3-BITUMINOUS COATED CORRUGATED STEEL PIPE AND PIPE ARCH:

Bituminous coated corrugated steel pipe, pipe arches, coupling bands, elbows, and other special sections shall conform to the requirements of AASHTO M 190. Coating and invert paving shall be of the type specified.

713.4-FULL BITUMINOUS COATED AND FULL PAVED CORRUGATED STEEL PIPE:

The pipe shall conform to the applicable requirements of AASHTO M 190 and in addition thereto, when riveted corrugated steel pipe is used, the rivets shall be placed on the outside crests of corrugations. Bituminous coating shall be in accordance with the requirements for Type A; the paving shall be in accordance with the requirements for Type B except that the pavement shall be formed on the inside for the entire circumference of the pipe. Smooth lined pipe over 30 inches (750 mm) in diameter shall have lifting lugs attached to each section when manufactured.

713.5-FIBER BONDED FULL BITUMINOUS COATED CORRUGATED STEEL PIPE AND PIPE ARCH:

713.5.1-Type A, Fiber Bonded Full Bituminous Coated: Fiber bonded full bituminous coated conduits shall comply with the requirements of AASHTO M 36 for base metal, and fabrication where applicable. The conduit shall be formed from sheets which have been coated on both sides with a layer of aramid fibers, applied in a sheet form by pressing them into a molten metallic bonding medium. Immediately after the metallic bond has solidified, the fibers shall be thoroughly saturated with a bituminous saturant. The finished sheets shall be of first class commercial quality, free from blisters and unsaturated spots. In addition, the conduit shall be coated inside and out with a bituminous material complying with the requirements of AASHTO M 190, Type A.

713.5.2-Type C, Fiber Bonded Full Bituminous Coated and Paved Invert: Fiber bonded full bituminous coated and paved conduits shall comply with all the requirements of 713.5.1 and shall be paved to conform with the requirements in AASHTO M 190, Type C.

713.6-FIBER BONDED FULL BITUMINOUS COATED AND FULL PAVED CORRUGATED STEEL SEWER PIPE:

Fiber bonded full bituminous coated and full paved steel sewer pipe shall comply with the requirements of 713.5.1, where applicable, and in addition thereto, the rivets shall be placed on the outside crests of the corrugations and the inside of the pipe shall be paved so that a smooth surface will be formed filling the corrugations of the pipe with a minimum thickness of ⅛ in. (3 mm) over the crests of the corrugations. Smooth lined pipe over 30 inches (750 mm) in diameter shall be provided with lifting lugs for each section when manufactured.

713.7-CORRUGATED STAINLESS STEEL CULVERTS AND UNDERDRAINS:

Corrugated stainless steel culverts and underdrains shall comply with the requirements of zinc coated (galvanized) corrugated iron or steel culverts and underdrains, AASHTO M 36, with the following exceptions (Numbers refer to Subsections in AASHTO M 36):

1. SCOPE

1.1 This specification covers corrugated stainless steel culverts and underdrains.

3. IRON OR STEEL SHEETS:

3.1 The stainless steel sheets shall conform with the requirements of SAE Standard J-405B, Alloy Grade SAE 51409.

6. SHEET MANUFACTURER'S GUARANTEE:

6.1 The manufacturer of the sheets shall submit with the certified analysis a guarantee providing that all metal furnished conforms with the Specification requirements, shall bear a suitable identification brand or mark, and shall be replaced without cost to the purchaser when not in conformity with the specified analysis and sheet thickness; and the guarantee shall be so worded as to remain in effect as long as the manufacturer continues to furnish material.

7. RIVETS:

7.1 Rivets shall conform to the requirements of SAE Standard J-405B, Alloy Grade SAE 51430, or ASTM A 276, Type 430.

10. CORRUGATIONS:

Corrugations shall be annular, spiral or a combination of annular and spiral.

12. RIVETED SEAMS:

12.2 For pipe with 1 in. (25 mm) deep corrugations, ½ in. (12 m) diameter bolts and nuts conforming to the requirements of ASTM A 276. Type 430, may be used in lieu of rivets or spot welds on a one-for-one replacement ratio.

In Table 2, substitute sheet thickness as follows:

.048 (1.2 mm)	.105 (2.7 mm)
.060 (1.5 mm)	.135 (3.4 mm)
.075 (1.9 mm)	.164 (4.2 mm)

15. RESISTANCE SPOT WELDED SEAMS:

15.1.2 The welding shall be performed in such a manner that (1) the exterior surfaces of 90 percent or more of the spot welds on a length of pipe shall show no evidence of burning of the metal. Discoloration of the spot weld surfaces will not be cause for rejection.

15.3.5 In Table 3, substitute sheet thickness as follows:

Inches (mm) (Approx.)	**Pounds (Mg)**
.048 (1.2 mm)	3,100 (1.40)
.060 (1.5 mm)	4,100 (1.85)
.075 (1.9 mm)	5,200 (2.36)
.105 (2.7 mm)	7,000 (3.17)
.135 (3.4 mm)	8,500 (3.85)
.164 (4.2 mm)	10,000 (4.52)

19. TYPE III PIPE:

19.1 Culverts furnished under this type shall consist of stainless steel corrugated metal pipe to be used in underdrains. Unless otherwise specified the pipe shall be perforated.

21. COUPLING BANDS:

21.1 Revise third sentence as follows: The coupling bands shall be made of base metal conforming to SAE Specification J-405B, Alloy Grade 51409.

23. WORKMANSHIP:

23.1.10 Delete this Subsection.

24. REPAIR OR DAMAGED SPELTER COATING:

713.8

Delete this Subsection.

25. Add the following notation: This Section applies only with reference to those factors applicable to a stainless steel sheet.

713.8-STRUCTURAL PLATE FOR PIPE, PIPE ARCH, AND ARCHES:

These conduits, and bolts and nuts for connecting plates, shall conform to the requirements of AASHTO M 167.

713.9-FULL BITUMINOUS COATED STRUCTURAL PLATE PIPE, PIPE ARCH, AND ARCHES:

These conduits shall conform to the requirements of AASHTO M 167 and shall be coated with bituminous material conforming to the requirements of AASHTO M 190, Type A Coating.

713.10-STAINLESS STEEL STRUCTURAL PLATE PIPE:

Stainless steel structural plate pipe shall comply with the applicable requirements of structural plate pipe, AASHTO M 167, with the following exceptions (Numbers refer to Subsections in AASHTO M 167):

1. SCOPE:
This specification covers stainless steel structural plate pipe.

2. BASE METAL:
The stainless steel sheets shall conform with the requirements of SAE Standard J-405B, Alloy Grade SAE 51409.

4. GAGE DETERMINATIONS AND TOLERANCE: In Table II substitute as follows:

Gage	Sheet Thickness (Inches)	Tolerance Under
1	.276 (7 mm)	.012 (300 µm)
3	.245 (6.2 mm)	.012 (300 µm)
5	.215 (5.5 mm)	.012 (300 µm)
7	.184 (4.7 mm)	.012 (300 µm)
8	.164 (4.2 mm)	.012 (300 µm)
10	.135 (3.5 mm)	.012 (300 µm)
12	.105 (2.7 mm)	.012 (300 µm)

8. CERTIFIED ANALYSIS AND GUARANTEE:
The manufacturer of the sheets shall submit with the certified analysis

a guarantee providing that all metal furnished conforms with the specification requirements, shall bear a suitable identification brand or mark, and shall be replaced without cost to the purchaser when not in conformity with the specified analysis and sheet thickness; and the guarantee shall be so worded as to remain in effect as long as the manufacturer continues to furnish material.

10. BOLTS AND NUTS FOR CONNECTING PLATES: Material for bolts and nuts shall conform to the chemical and mechanical requirements of ASTM A 276, Type 431, Condition T. Size and geometric configuration shall conform to the applicable requirements of ASTM A 325, Paragraph 5.

713.11-METALLIC COATED CORRUGATED STEEL UNDERDRAIN PIPE:

Metallic coated corrugated steel underdrain pipe shall conform with the requirements of AASHTO M 36 Type III.

713.12-BITUMINOUS COATED CORRUGATED STEEL UNDERDRAIN PIPE:

This pipe shall conform to the requirements of AASHTO M 36, Type III, and shall be coated with bituminous material conforming to the requirements of AASHTO M 190, Type A coating, except that the minimum coating thickness, shall be 0.03 in. (750 µm) Coupling bands shall be fully coated. The specified minimum diameter of perforations shall apply after coating.

713.13-BLANK

713.14-CORRUGATED ALUMINUM ALLOY PIPE AND PIPE ARCHES:

Corrugated aluminum alloy pipe and pipe arches shall conform to the requirements of AASHTO M 196, Type I and II. Helically corrugated aluminum alloy culvert pipe shall conform to the requirements of AASHTO M 211.

Certification from the manufacturer will be the basis of acceptance for band material and rivets used in the fabrication.

713.15-BITUMINOUS COATED CORRUGATED ALUMINUM ALLOY PIPE AND PIPE ARCHES:

Bituminous coated corrugated aluminum alloy pipe, pipe arches, coupling bands, elbows, and other special sections shall conform to the requirements of AASHTO M 190. Coating and invert paving shall be of the type specified.

713.16-CORRUGATED ALUMINUM ALLOY PIPE UNDERDRAIN:

Corrugated aluminum alloy pipe underdrain shall conform to the requirements of AASHTO M 196, Type III.

713.17-BITUMINOUS COATED CORRUGATED ALUMINUM ALLOY PIPE UNDERDRAIN:

This pipe shall conform to the requirements of AASHTO M 196, Type III, and shall be coated with bituminous material conforming to the requirements of AASHTO M 190, Type A coating, except the minimum coating thickness shall be 0.03 in. (750 µm) Coupling bands shall be fully coated. The specified minimum diameter of perforations shall apply after coating.

713.18-ALUMINUM ALLOY STRUCTURAL PLATE FOR PIPE, PIPE ARCH, AND ARCHES:

These conduits and the bolts and nuts for connecting plates shall conform to the requirements of AASHTO M 219.

713.19-FULL BITUMINOUS COATED ALUMINUM ALLOY STRUCTURAL PLATE PIPE, PIPE ARCH, AND ARCHES:

These conduits shall conform to the requirements of AASHTO M 219 and shall be coated with bituminous material conforming to the requirements of AASHTO M 190, Type A coating.

713.20-END SECTIONS FOR CORRUGATED STEEL PIPE AND PIPE ARCHES:

End sections for corrugated iron or steel pipe and pipe arches shall be of the thickness recommended by the manufacturer, and they shall conform to the applicable requirements of AASHTO M 36 and the details shown on the Plans.

713.21-END SECTIONS FOR CORRUGATED ALUMINUM ALLOY PIPE AND PIPE ARCHES:

End sections for corrugated aluminum alloy pipe and pipe arches shall be of the thickness recommended by the manufacturer and they shall conform to the applicable requirements of AASHTO M 196 or M 211 and the details shown on the Plans.

713.22-BLANK

713.23-PRECOATED, METALLIC COATED STEEL PIPE AND UNDERDRAIN:

Precoated sheets shall have a Type B coating conforming with the requirements of AASHTO M 246. The minimum thickness shall be 10 mils (250 µm) on the inside and 3 mils (75 µm) on the outside of the pipe.

Precoated, metallic coated steel pipe and underdrain shall conform to the requirements of AASHTO M 245 with the following exceptions (numbers refer to subsections of AASHTO M 245).

19.1 Coupling bands, conforming to the requirements of AASHTO M 218, will not require organic coating.

22.1.1 Damaged areas of spelter coating shall be painted in this sequence:
1. Zinc rich primer conforming to Section 711.21.
2. Red oxide lacquer primer.
3. Lacquer.

22.1.2 Areas of damaged polymeric coating only shall be painted in this sequence after the areas are rubbed with commercially available acetic acid (such as vinegar) and dried:
1. Red oxide lacquer primer.
2. Lacquer.

The primer and lacquer as specified above must be mutually compatible when applied and compatible with the polymeric coating. The red oxide primer and lacquer, which are commercially available, shall be allowed to completely dry between coats and before handling and backfilling. If the lacquer is applied from a spray can, a minimum of two coats is required. The first coat should provide a light covering, and the second coat should be applied heavily just to the point of running.

713.24-ALUMINUM COATED CORRUGATED STEEL PIPE AND PIPE ARCH:

These conduits shall conform to AASHTO M 36 requirements for aluminum coated or aluminum-zinc coated corrugated steel pipe and pipe arch.

SECTION 714
CONCRETE, CLAY, FIBER AND PLASTIC PIPE

714.1-NONREINFORCED CONCRETE PIPE:

This pipe shall conform to the requirements of AASHTO M 86 or ASTM C 14.

714.2-REINFORCED CONCRETE CULVERT, STORM DRAIN AND SEWER PIPE:

This pie shall conform to the requirements of AASHTO M 170 or ASTM C 76.

714.3-REINFORCED CONCRETE ARCH CULVERT, STORM DRAIN AND SEWER PIPE:

This pipe shall conform to the requirements of AASHTO M 206 or ASTM C 506.

714.4-REINFORCED CONCRETE ELLIPTICAL CULVERT, STORM DRAIN AND SEWER PIPE:

This pipe shall conform to the requirements of AASHTO M 207 or ASTM